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(12) UK Patent Application (19) GB (11) 2 254 586 (13) A

(43) Date of A publication 14.10.1992

(21) Application No 9107667.9

(22) Date of filing 11.04.1991

(51) INT CL[5]
B41F 19/06

(52) UK CL (Edition K)
B6J JC J204 J804
U1S S2234

(56) Documents cited
None

(58) Field of search
UK CL (Edition K) B6J JC
INT CL[5] B41F, B44C
Online databases: WPI, CLAIMS

(71) Applicant
Profoil Systems Limited

(Incorporated in the United Kingdom)

Foxtail Road, Ransomes Park Industrial Estate,
Ipswich, Suffolk, IP3 9RT, United Kingdom

(72) Inventor
Michael Adrian Castleton

(74) Agent and/or Address for Service
Dummett Copp & Co
14 The Square, Martlesham Heath,
Ipswich, IP5 7SL, United Kingdom

(54) Foil blocking apparatus

(57) In a foil blocking apparatus, foil 22 is fed through a foil application station 16 at a rate which is different from that of the surface to be decorated. The foil is fed from a roll 24 and the imbalance between the discontinuous nature of the foil movement through the application station and the continuous rotation of the roll 24 is compensated for by an accumulator 28. The foil is drawn stepwise through the application station 16 by drive rolls 38.

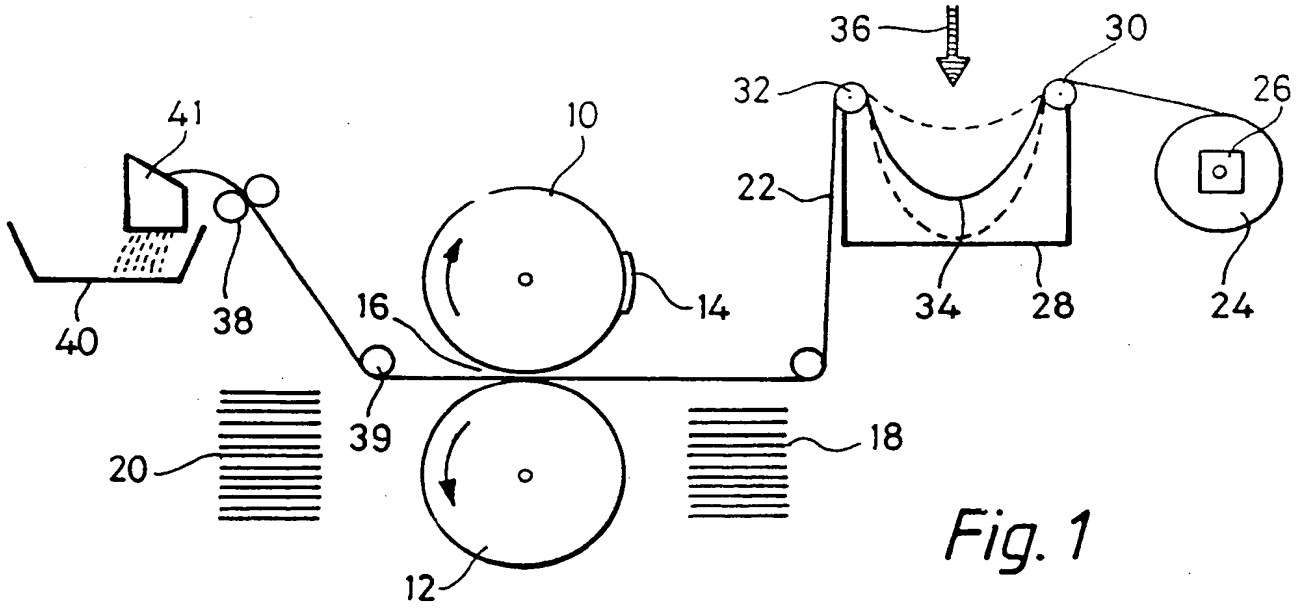

Fig. 1

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1990.

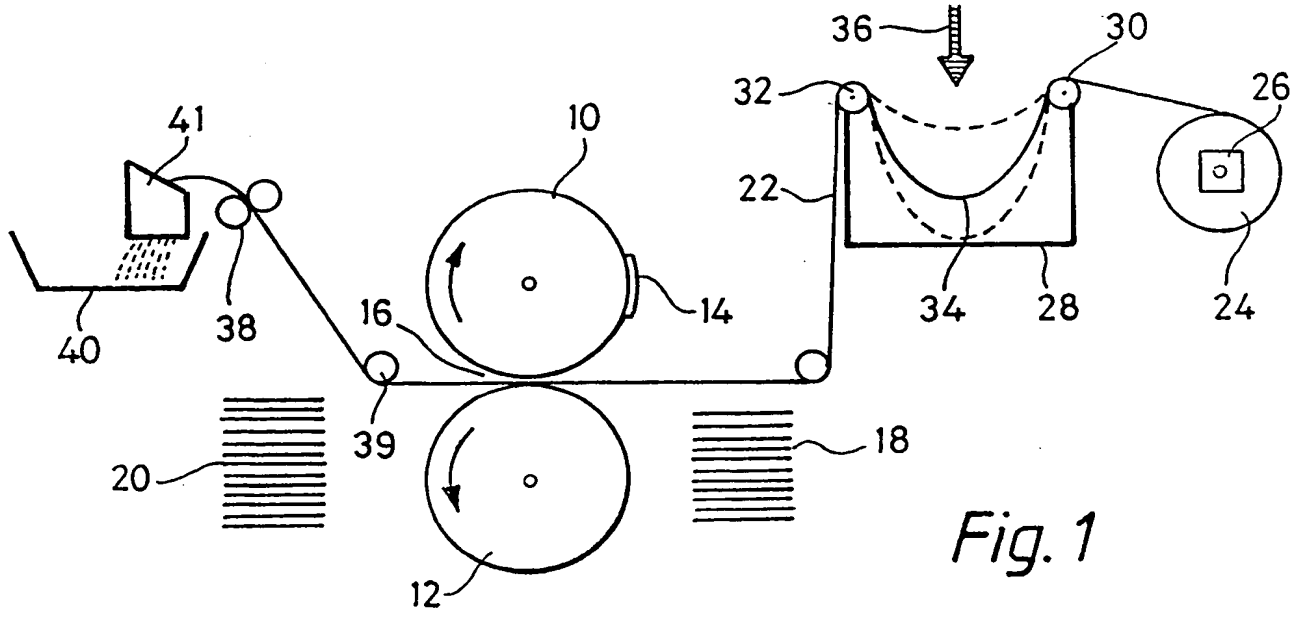

Fig. 1

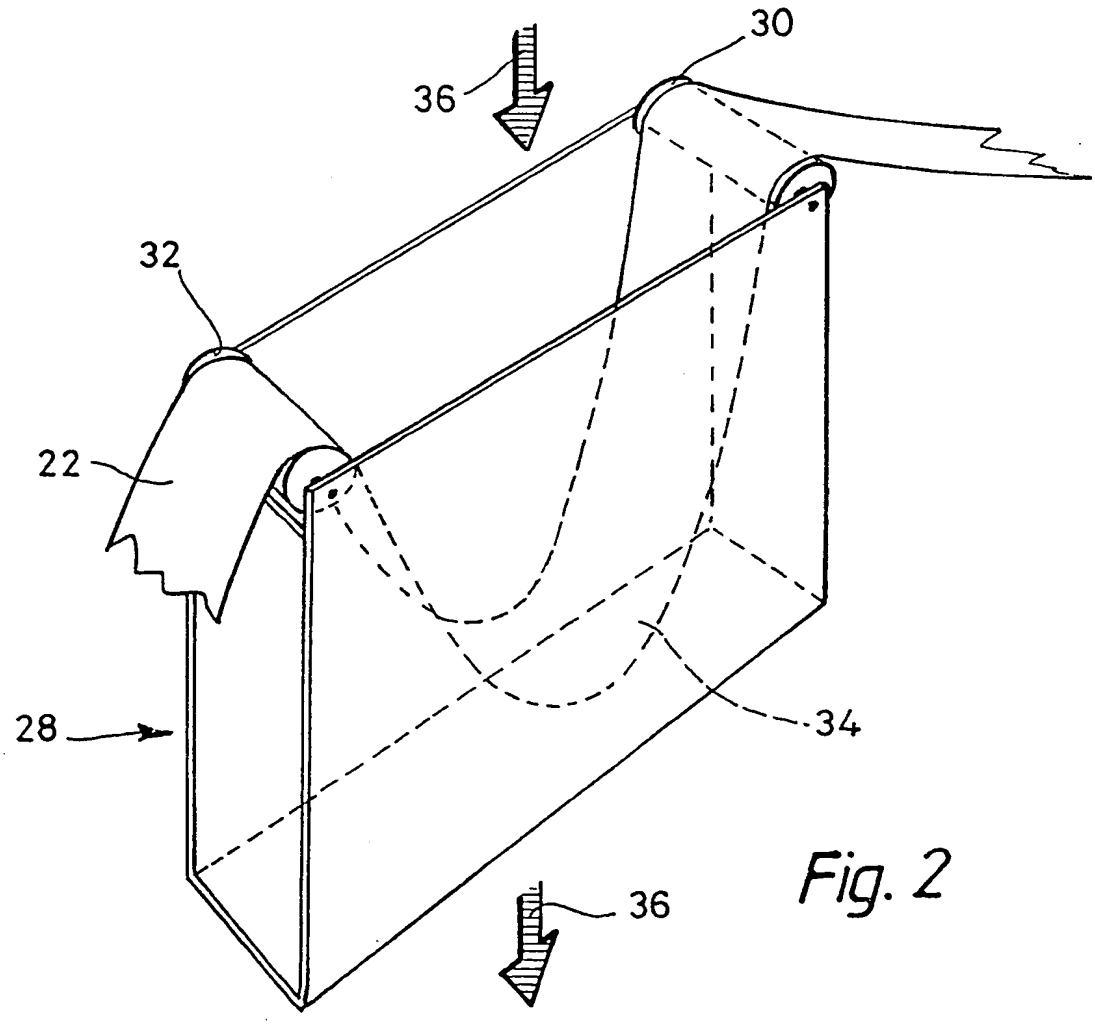

Fig. 2

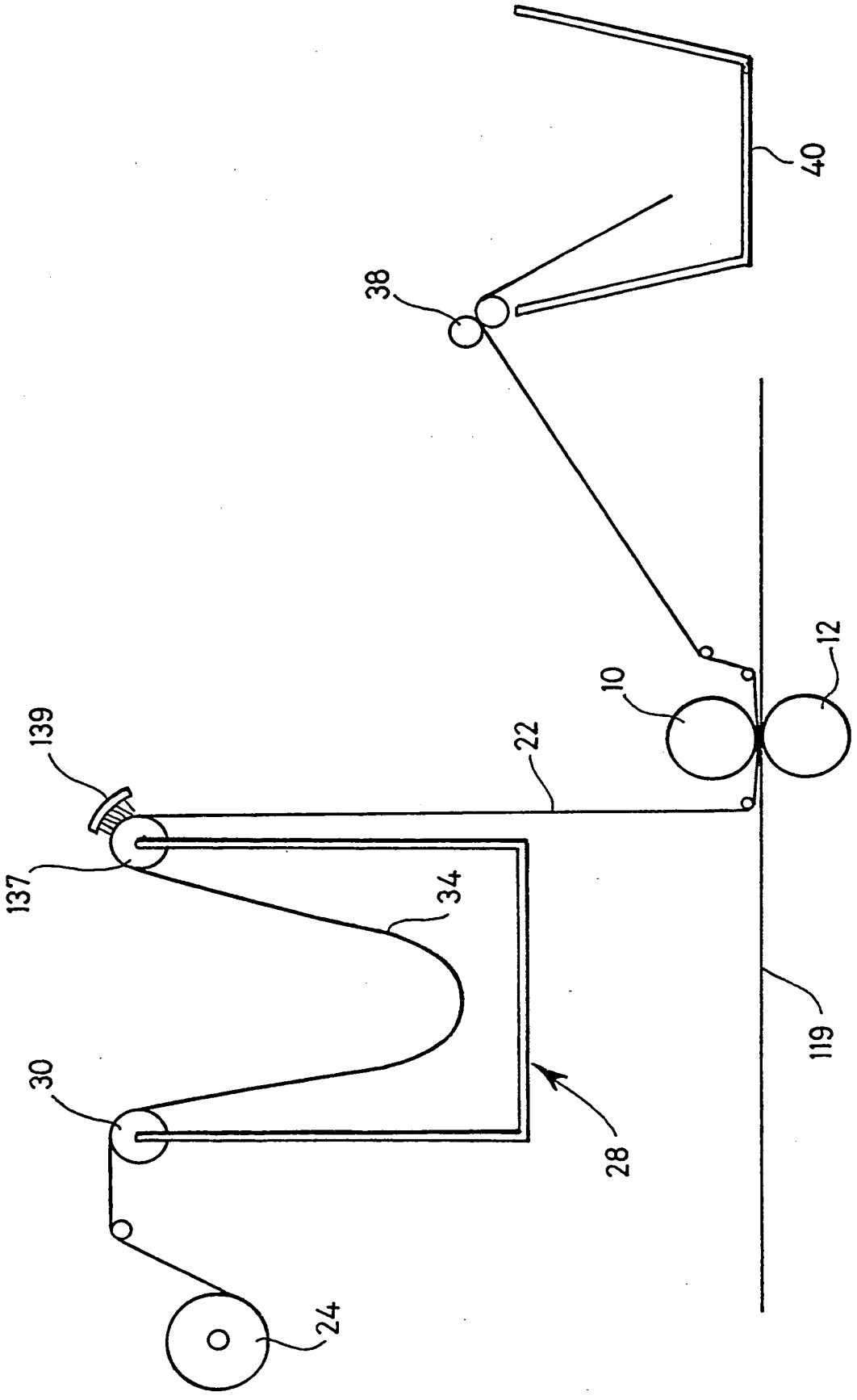

Fig. 3

Foil Blocking Apparatus

This invention relates to the process of foil blocking, and in particular to an apparatus for carrying out the process.

In foil blocking, a thin coating of a decorative foil is transferred by heat and pressure from a carrier film onto a surface to be decorated (hereinafter referred to as print material) by pressing a heated metal die against the print material with the foil interposed between the die and the material at a workstation. The foil is supplied in the form of a laminate, in roll form, with heat and pressure sensitive adhesive on one side of a decorative layer, a carrier layer on the opposite side of the decorative layer, and a release agent between the carrier layer and the decorative layer so that the two can be separated once the decorative layer has been adhered to the printed material.

The foil is conventionally fed from a reel on one side of the workstation, is pulled through the workstation under tension and is then gathered up and discarded. Because foil blocking is a discontinuous process, ie foil is supplied to only part of each surface to be decorated, to avoid wastage of foil it is preferred to move the foil band and the print material through the workstation at different rates.

According to the present invention, there is provided a foil blocking apparatus comprising a workstation including a foil blocking die and a bed, means for feeding print material to be foil blocked between the die and the bed, and means for feeding foil between the die and the bed in the form of a continuous band, wherein the foil feeding means includes a continuously driven foil supply station from which foil is supplied into a foil accumulator, and a

foil feed station downstream of the accumulator arranged to feed the foil stepwise through the workstation.

The use of a foil accumulator allows the foil supply station to run continuously at a constant speed. This avoids the need to accelerate and decelerate what might be a large capacity roll. When the foil feed station is not operating, the foil supply station will be supplying foil into the accumulator, and when the foil feed station is operating it will draw foil from the accumulator.

The invention is particularly applicable for use in a rotary foil blocking process, where the foil blocking die is mounted on a cylinder, and where the bed is also formed by the surface of a cylinder. According to a second aspect of the invention there is provided a foil blocking apparatus comprising a foil blocking die positioned on the surface of a rotatable die cylinder, a rotatable impression cylinder mounted parallel to the die cylinder so as to define a nip between the cylinders, means for feeding print material to be foil blocked through the nip as the cylinders rotate, and means for feeding foil through the nip in the form of a continuous band, wherein the foil feeding means includes a continuously driven foil supply station from which foil is supplied from a roll into a foil accumulator, and a foil feed station downstream of the accumulator arranged to feed the foil stepwise through the nip.

It is preferable if the foil is held under tension in the accumulator, and this can be achieved by arranging the foil so that a bight of foil is placed in an air flow. The air flow then tensions the foil band between two fixed points. The fixed points may be defined by rollers.

In one preferred form, the accumulator takes the form of a parallel sided box with an open top and an open bottom, with the distance between the sides of the box being equal to or greater than the width of the foil band. The air flow will then be directed through the box, from top to bottom.

There may be a sensor at the bottom of the accumulator to provide a signal if the bight of foil becomes so large that it approaches the bottom of the box. This signal will then indicate that the foil supply station should stop or slow down to allow the feed station to catch up. If the foil does touch the bottom of the box, tension will be lost in the foil band, and it will become impossible to determine how much foil is in the accumulator.

The foil may be drawn from the accumulator by a foil feed station downstream of the nip, and the foil feed station will pull against the tension under which the foil is placed in the accumulator. If necessary, there may be an additional mechanism on the upstream side of the nip to provide a resistance to feed movement of the foil band.

The invention will now be further described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a schematic side view of a foil blocking apparatus in accordance with the invention;

Figure 2 is a perspective view showing an accumulator for use with the apparatus of Figure 1; and

Figure 3 is an alternative foil blocking arrangement in accordance with the invention.

Figure 1 shows a die cylinder 10 and a impression cylinder 12. The die cylinder carries a foil blocking die 14 on its surface, and the cylinders 10 and 12 form a nip 16 between them. The apparatus is set up to apply foil blocking to print material in the form of a feed stack of sheets 18. Each sheet passes individually to the impression cylinder 12 where it is fastened around the cylinder surface and is carried through the nip 16, and is then collected on a delivery stack 20. The apparatus can however also operate with print material in the form of a web, and this is shown in Figure 3. Transport of the print material through the nip takes place in a conventional manner and will not be further described in this specification.

Also passing through the nip is a foil band 22. The band is fed from a supply reel 24 which is driven by a drive motor 26 to unwind the foil. The band 22 is then pulled from the reel into an accumulator 28, where it hangs in a loop or bight between an entry roller 30 and an exit roller 32. The surface speed of the foil leaving the reel is monitored and the speed of the motor 26 is controlled so that the foil band travels with a constant velocity irrespective of the diameter of foil remaining on the reel. In order to maintain tension in the bight 34, an air current is passed through the accumulator in the direction indicated by an arrow 36. The accumulator has a bottom which may be open or may have holes in it so that the air can flow out past the foil band after having pulled it into the bight 34.

Depending on the quantity of foil in the accumulator, the bight 34 may lie in the position illustrated in bold lines or in either of the positions illustrated in dotted lines in Figure 1 or in any intermediate position, all of which represent different quantities of foil in the accumulator.

After leaving the accumulator, the foil band passes through the nip, around an idler roll 39 and to a foil indexing and feed station 38. After leaving the feed station 38, the foil is passed through a shredder 41 and into a bin 40. The foil in the bin 40 will be discarded.

In use, the motor 26 will run continuously to feed foil from the supply reel 24 into the accumulator. Whilst the foil feed rolls 38 are not operating, the quantity of foil in the accumulator will increase and whilst the feed rolls 38 are operating, the quantity of foil in the accumulator will decrease. The storage capacity of the accumulator will be determined by the relative feed rates of the drive 26 and the rolls 38.

The cylinders 10 and 12 will rotate constantly. A sheet of print material will be fed from the feed stack 18 so as to lie on the surface of the impression cylinder and pass through the nip 16 at the same time as the die 14 passes through the nip. The die 14 (which will be heated) will press the foil band 22 against the sheet of print material to apply a decorative pattern to the print material in accordance with the pattern on the die. As this happens, the foil band 22 must be moving at the same speed as the surface of the die 14. The foil blocked print material is then ejected from the nip 16 and stacked on the delivery stack 20.

As soon as the die 14 leaves the nip 16, the foil band 22 should stop moving. If it continues to move, an excessive quantity of foil will be wasted. The speed of rotation and the angular position of the die roll 10 is monitored by a sensor which sends a signal to a processor to indicate when the die 14 is approaching the nip. The processor then signals the feed rolls 38 to start operation in sufficient time for the foil to be accelerated up to the surface speed

of the die 14, by the time the die enters the nip. As soon as the die leaves the nip, the sensor will send a signal to the rolls 38 to tell the rolls to stop. The feed rolls will need to start to operate a short time before the die enters the nip, so that the foil can be brought from a standstill up to the surface speed of the die by the time the die and the foil come into contact.

However because the feed rolls 38 only need to accelerate that part of the foil between the feed rolls themselves and the accumulator, there is no great mass to be accelerated and decelerated. The major mass in the system, which lies primarily with the supply reel 24, runs continuously. As a result a relatively large capacity supply reel 24 can be used because there will be no requirement to accelerate and decelerate the reel itself. Furthermore, because of the store of foil in the accumulator, changeovers from the end of one supply reel to the beginning of another can be accomplished without stopping the operation of the machine. It will only be necessary to discard the one or two sheets of print material which pass through the nip at the same time as the join between the foils from two supply reels.

Figure 2 shows one simple construction for the accumulator in the form of a parallel sided box with an open top and an open bottom, and with the entry and exit rollers 30 and 32 mounted at the top corners. The depth of the box will be determined by the quantity of foil which will need to be stored there.

Figure 3 shows an arrangement where the print material 119 is in web form.

As an alternative to the use of a current of air to keep the foil in the accumulator in tension, the foil may take up the configuration shown in Figure 3 under the influence

of gravity. However on the downstream side of the accumulator a tension roll 137 takes the place of the exit roller 32 and is positioned in the path of the foil and co-operates with a friction element 139 which may for example take the form of a brush. The bristles of the brush will exert a force on the surface of the foil which will resist the foil being pulled through the gap between the 137 and the element 139. This will then ensure that the foil is placed in tension between the tension roll 137 and the feed rolls 38.

Although the use of an accumulator has been described here with reference to a rotary foil blocking apparatus, an accumulator can also be used advantageously with a conventional fixed bed foil blocking process. The use of an accumulator with a fixed bed can allow the feed roll to be mounted on a stationary part of the machine so that it does not have to reciprocate with the fixed bed. As the bed moves in a direction away from the accumulator, foil will be drawn from the accumulator and as the bed moves in the opposite direction, the accumulator will be replenished. Because the roll does not move itself, larger foil rolls can be used resulting in less downtime due to roll changes.

Where the foil blocking process is used to apply pre-printed foil, or holograms, onto the print material then a registration arrangement (which may be associated with the feed and indexing station 38) can be incorporated to sense a feature on the foil band and to coordinate the position of the foil band with the rotation of the cylinders. The foil can then be fed to the correct position for the pre-printed marking on the foil to register with the die 14 as the die approaches the nip.

The use of an accumulator in a foil blocking apparatus as set out above allows a considerable increase in throughput, and a reduction in necessary downtime during operation of the machine.

Claims

1. A foil blocking apparatus comprising a workstation including a foil blocking die and a bed, means for feeding print material to be foil blocked between the die and the bed, and means for feeding foil between the die and the bed in the form of a continuous band, wherein the foil feeding means includes a continuously driven foil supply station from which foil is supplied into a foil accumulator, and a foil feed station downstream of the accumulator arranged to feed the foil stepwise through the workstation.

2. Apparatus as claimed in Claim 1, wherein the foil blocking die is mounted on a cylinder and the bed is also formed by the surface of a cylinder.

3. A foil blocking apparatus comprising a foil blocking die positioned on the surface of a rotatable die cylinder, a rotatable impression cylinder mounted parallel to the die cylinder so as to define a nip between the cylinders, means for feeding print material to be foil blocked through the nip as the cylinders rotate, and means for feeding foil through the nip in the form of a continuous band, wherein the foil feeding means includes a continuously driven foil supply station from which foil is supplied from a roll into a foil accumulator, and a foil feed station downstream of the accumulator arranged to feed the foil stepwise through the nip.

4. Apparatus as claimed in Claim 3, wherein the foil is held under tension in the accumulator by arranging the foil so that a bight of foil which extends between two fixed supports is placed in an air flow.

5. Apparatus as claimed in Claim 4, wherein the fixed supports are formed by rollers.

6. Apparatus as claimed in any preceding claim, wherein the accumulator takes the form of a parallel sided box with an open top and an open bottom, with the distance between the sides of the box being equal to or greater than the width of the foil band, the apparatus including means to direct an air flow through the box, from top to bottom.

7. Apparatus as claimed in Claim 6, wherein a sensor at the bottom of the accumulator provides a signal if the bight of foil becomes so large that it approaches the bottom of the box.

8. Apparatus as claimed in any preceding claim, wherein the foil is drawn from the accumulator by a foil feed station downstream of the nip, and wherein the foil feed station pulls against the tension under which the foil is placed in the accumulator.

9. Apparatus as claimed in Claim 8, wherein an additional mechanism is present on the upstream side of the nip to provide a resistance to feed movement of the foil band.

10. A foil blocking apparatus substantially as herein described with reference to and as shown in the accompanying drawings.

Patents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search Report)

Application number
9107667.9

Relevant Technical fields

(i) UK Cl (Edition K) B6J (JC)

(ii) Int CL (Edition 5) B41F, B44C

Search Examiner
R J MIRAMS

Databases (see over)

(i) UK Patent Office

(ii) ONLINE DATABASES: WPI, CLAIMS

Date of Search
16 JUNE 1992

Documents considered relevant following a search in respect of claims 1 TO 10

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
	NONE	

Category	Identity of document and relevant passages	Relevant to claim(s)

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